

THE GENUS *DAPHNELLOPSIS* (GASTROPODA: MURICIDAE) IN THE RECENT AND QUATERNARY OF THE INDO-WEST PACIFIC PROVINCE

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Abstract The muricid genus *Daphnellopsis* Schepman 1913 is revised and maintained in the subfamily *Ergalataxinae*, waiting for eventual genetic studies. Six species are included, *D. fimbriata* (Hinds 1843), *D. lamellosa* Schepman 1913 (type species), *D. hypselos* Houart 1995 and three new species described herein: *D. lozoueti* n. sp.; and *D. pinedai* n. sp., both from the Quaternary (Upper Pleistocene) of Santo, Vanuatu, and *D. lochi* n. sp. a Recent species of Western Australia.

All the species are described or re-described, illustrated and compared with each other, their geographical range is given and illustrated on a map. The protoconchs of five species are illustrated as well as some details of the shells. A jaw is pointed out for the first time in *D. fimbriata* and is illustrated by scanning electron microscope (SEM) images.

Key words *Gastropoda*, *Muricidae*, *Ergalataxinae*, *Daphnellopsis*, Indo-West Pacific

INTRODUCTION

The genus *Daphnellopsis* was originally described in the Turridae by Schepman (1913: 449), together with a new species. Iredale (1918: 33) considered this genus close to *Maculotriton*, a genus then classified in the Bursidae. Hedley (1922: 356) preferred to include it with the Turridae and described another new species as *Daphnellopsis murex*, now placed in *Lindapterys* Petuch 1987.

Powell (1966: 140) included *Daphnellopsis* in a chapter devoted to genera considered to be doubtfully placed within the Turridae and added that no turrid sinus was quite like that of *Daphnellopsis* and that "the style of sculpture is decidedly muricid".

Houart (1986: 433) illustrated a drawing of the radula for the first time and transferred the genus to the Muricidae, subfamily Thaidinae Suter 1915.

Kilburn (1992: 217) discovered another name, *D. fimbriata* (Hinds 1843), that was originally described in the Turridae and transferred it also to the Muricidae, however considering it a senior synonym of *D. lamellosa* Schepman 1913. Houart (1995) separated both species, described another new species as *D. hypselos* and placed the genus in the *Ergalataxinae*.

MATERIAL AND METHODS

The present report deals with species collected during 14 expeditions organized by MNHN

and IRD (formerly ORSTOM). *Daphnellopsis* specimens were collected during the following cruises: BIOGEOCAL (1987), SMIB 5 (1989), SMIB 8 (1993), BATHUS 1 (1993), BATHUS 4 (1994), all New Caledonia; MUSORSTOM 3 (1985), PANGLAO 2005, AURORA 2007, all Philippines; MUSORSTOM 10 (2005), Fiji; TAIWAN 2001; SALOMON 1 (2001); BOA 1 (2005), SANTO (2006), both Vanuatu, Recent and Pleistocene, and MIRIKY (2009), Madagascar. All this material is held in MNHN.

Material also originates from the AMS. The specimens were collected during several expeditions off Queensland and Western Australia between 1967 and 1998, aboard MV Kos 2 in 1967, MV San Pedro in 1969, HMAS Kimbla in 1977, 1981, 1984 and 1998 and aboard FRV Soela in 1983. Most of these specimens were discovered and sorted by Ian Loch in the Turridae collection.

The Pleistocene specimens from Vanuatu were collected during a preliminary exploration of the fossil sites in February 2006 initiated for the SANTO Expedition in September-October 2006. All the fossil *Daphnellopsis* come from the Kere 1 deposit (= Kere Shellbed of Mallik and Ladd). A well-preserved coral (*Flabellum* sp.) collected in this outcrop gave an age of 133 000 yr. (Lozouet *et al.*, 2011).

Abbreviations The terminology used to describe the complex spiral cord configuration follows Merle (1999, 2001) and is illustrated in Fig. 1 A-C. **P**: primary cord; **s**: secondary cord; **t**: tertiary cord; **ad**: adapical (or adaperatural); **ab**: abapical

(or abapertural); **IP**: infrasutural primary cord (primary cord on subsutural ramp); **P1**: shoulder cord; **P2-P6**: primary cords of the convex part of the teleoconch whorl; **s1-s6**: secondary cords of the convex part of the teleoconch whorl (example: s1 = secondary cord between P1 and P2; s2 = secondary cord between P2 and P3, etc.); **ADP**: adapertural primary cord on the siphonal canal; **MP**: median primary cord on the siphonal canal; **ABP**: abapertural primary cord on the siphonal canal (terminology in parentheses above indicates an erratic feature).

Abbreviations used for collections:

AMS	The Australian Museum, Sydney, Australia.
IRD	Institut de Recherches pour le Développement.
MNHN	Muséum national d'Histoire naturelle, Paris, France.
NHMUK	Natural History Museum, London, United Kingdom.
ORSTOM	Office de la Recherche Scientifique et Technique Outre-Mer
RH	collection of the author.

RMNH	Nationaal Natuurhistorisch Museum, Leiden, The Netherlands (now in Naturalis Biodiversity Center, Leiden, the Netherlands).
ZMA	Zoologisch Museum, Universiteit van Amsterdam, The Netherlands (now in Naturalis Biodiversity Center, Leiden, the Netherlands).

Other abbreviations:

dd	empty shell
lv	live taken.

SYSTEMATIC ACCOUNT

Family Muricidae Rafinesque 1815

Genus *Daphnellopsis* Schepman 1913

Type species by original designation:

Daphnellopsis lamellosa Schepman 1913, Savu Sea, Indonesia.

Description Shell up to 19 mm in length. Length/width ratio 2.0–2.9, slender, lanceolate, narrow, lightly built, frilly. Subsutural band narrow,

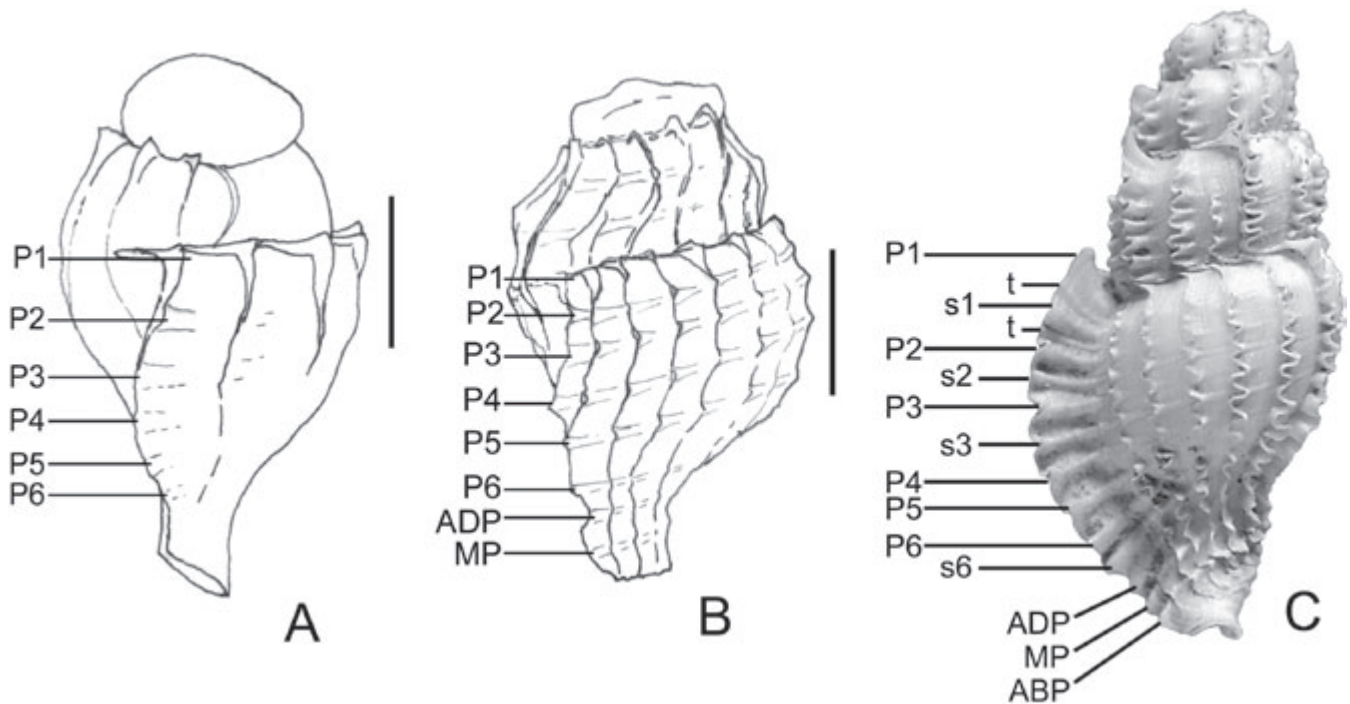


Figure 1 Spiral cords morphology (scale bars 500 µm). **A** *Daphnellopsis fimbriata* (Hinds 1843). New Caledonia, BATHUS 1, stn DE 700, 20°57' S, 165°35' E, 160–222 m. **B** *Daphnellopsis lamellosa* Schepman 1913. Fiji, Bligh Water, MUSORSTOM 10, stn DW 1314, 17°61' S, 178°15' E, 656–660 m. **C** *Daphnellopsis pinedai* n. sp. Vanuatu, Pleistocene of Santo, Kere River, near Finmele (site 1), 15°33' S, 166°57' E, coarse detrital level, holotype MNHN 25741, 13.5 mm.

weakly or strongly sloping, weakly convex or concave.

Spire very high, acute. Teleoconch up to 6 weakly convex, narrow whorls. Suture impressed, generally obscured by small axial lamellae of following whorl.

Axial sculpture of teleoconch whorls consisting of numerous, low or moderately high, narrow, frilly lamellae and ribs. Last teleoconch whorl with 8–25 lamellae or ribs. Spiral sculpture of low or moderately high, occasionally obsolete, weak or strong, rounded, narrow, primary, secondary and tertiary cords. Last teleoconch whorl with 15–25 cords.

Aperture small or moderately large, narrow. Columellar lip narrow or broad, smooth. Anal notch weak. Outer lip slightly erect, very weakly crenulated, flaring adapically and abapically. Primary and secondary cords ending as very low, smooth crenulations on outer lip, extending as narrow, occasionally very low ridges on edge of aperture and very short, narrow denticles inside the edge (Fig. 8F). Aperture otherwise smooth within. Siphonal canal short, 11–22% of shell length, broad, straight or dorsally recurved, open. Operculum unknown.

Radula rachiglossate with a tricuspid rachidian tooth bearing a long, broad, central cusp, 2 or 3 very narrow, irregularly shaped lateral denticles and a long, broad, lateral cusp, approximately

half the size of the central cusp, occasionally with an additional outer lateral denticle. Marginal area smooth, very broad. Lateral teeth sickle-shaped with very broad base and narrow, recurved distal end. Presence of a simple jaw (Fig. 8G–I).

Daphnellopsis fimbriata (Hinds 1843)

(Figs 1A, 2, 8A, G–J, 9A–R, 10A–E)

Clavatula fimbriata Hinds, 1843: 43; 1844: 22, pl. 7, fig. 9.

Type material Lectotype NHMUK 1844.6.7.57, 1 paralectotype NHMUK 1879.2.26.76, selected by Kilburn (1992).

Type locality North coast of New Guinea, 40 m.

Other material examined **Southern Mozambique:** 1 lv, coll. J. Rosado. **North-west Madagascar:** between Majunga and Cape St. André, MIRIKY, stn DW 3258, 15°34' S, 45°44' E, 200–288 m, 10 July 2009, 2 dd, MNHN; **Australia:** Queensland, E of North West Is, Capricorn Channel, HMAS Kimbla, stn 22, 23°15' S, 152° 24' E, 284 m, 14 December 1998, 1 dd, AMS C.321951; Northern Territory, Arafura Sea, ca. 100 ml N of Croker Id, MV San Pedro, Box dredge, stn P69–1144, 9°30' S, 132°34' E, 124 m, 09 November 1969, 1 dd, AMS C.322882; Queensland, SE of Swain Reefs, HMAS Kimbla, stn 8, 22°31' S, 152° 43' E, 78 m, 05 July

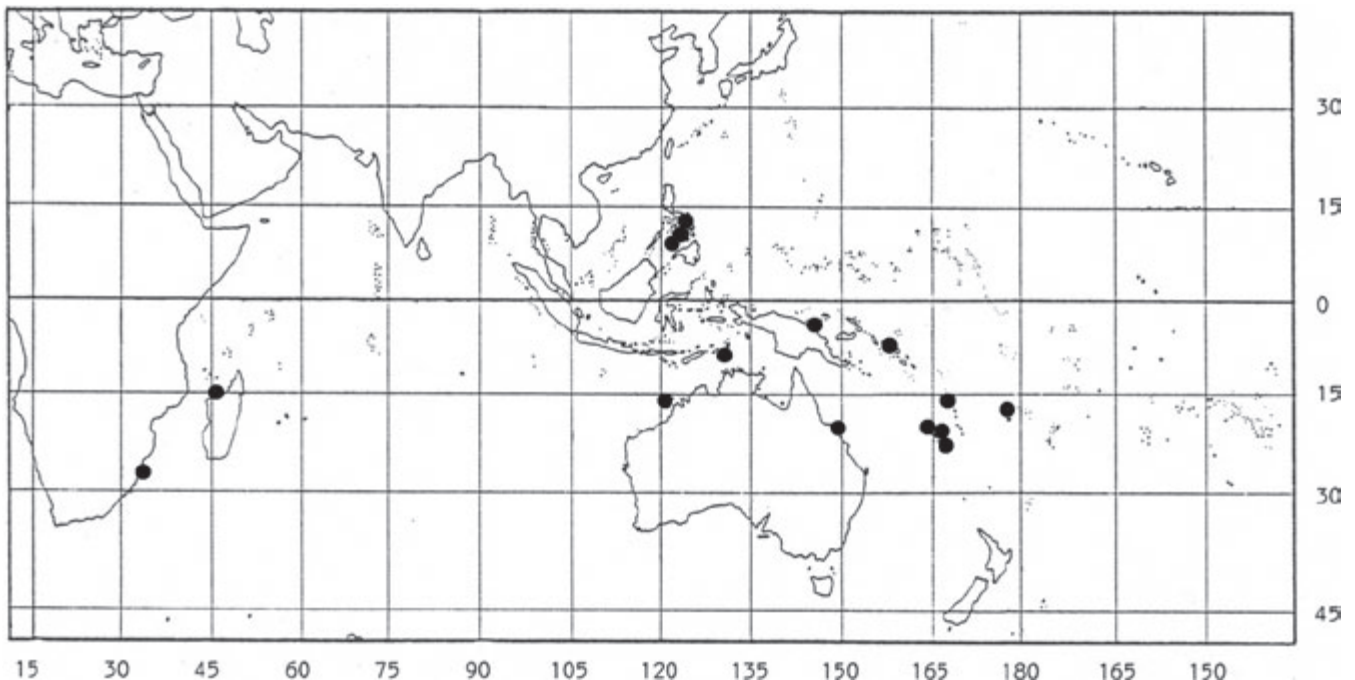


Figure 2 Geographical distribution of *D. fimbriata*.

1984, 1 dd, AMS C.321917; Western Australia, North West Shelf, ca 100 ml NW of Broome, MV Kos 2, stn K67/248, 16°58' S, 120°47' E, 194 m, 29 November 1967, 1 dd, AMS C.323130. **Philippine Islands:** North of Mindanao, Aliguay Id, 8°45' N, 123°13' E, 50–230 m, 15 lv & dd; Bohol, Balicasag Id, 9°31' N, 123°41' E, 150 m, 1 dd, RH; Mactan Id, Punta Engaño, 10°19' N, 124°00' E, 180–250 m, 1 lv, RH; MUSORSTOM 3, stn CP143, 11°29' N, 124°11' E, 205–214 m, 07 June 1985, 3 dd, MNHN. **Loyalty Basin:** BIOGEOCAL, stn DW 253, 21°32' S, 166°29' E, 310–315 m, 16 April 1987, 2 dd, MNHN; Loyalty Ridge, SMIB 5, stn DW 89, 22°19' S, 168°41' E, 295 m, 13 September 1989, 1 lv, MNHN. **New Caledonia:** BATHUS 1, stn DE 700, 20°57' S, 165°35' E, 160–222 m, 18 March 1993, 1 dd, MNHN; stn DW 706, 21°42' S, 166°34' E, 247–252 m, 19 March 1993, 1 dd, MNHN; South of New Caledonia, Kaimon Manu Bank, stn SMIB 8, 24°46' S, 168°08' E, 241–245 m, 28 January 1993, 1 dd, MNHN; North of New Caledonia, BATHUS 4, stn DW 894, 20°16' S, 163°52' E, 245–268 m, 03 August 1994, 1 dd, MNHN. **Vanuatu:** SANTO, Pleistocene of Santo, Kere River, near Finmele (site 1), 15°33' S, 166°57' E, coarse detrital level, 20–25 February 2006. **Solomon Islands:** SALOMON 1, stn DW 1767, 8°19' S, 160°40' E, 98–200 m, 28 September 2001, 1 lv, MNHN; stn CP 1781, 8°31' S, 160°38' E, 1036–1138 m, 29 September 2001, 1 dd, MNHN. **Fiji:** south of Viti Levu, MUSORSTOM 10, stn DW 1381, 18°18' S, 177°54' E, 275–430 m, 18 August 1998, 1 dd, MNHN.

Distribution Southern Mozambique, north-western Madagascar, north-western, northern and north-eastern Australia, southern and central Philippines, Papua New Guinea (type locality), New Caledonia, Solomon Islands and southern Viti Levu (Fiji), live in 180–200 m.

Description Shell large for the genus, up to 19 mm in length. Length/width ratio 2.0–2.6, slender, lanceolate, narrow, lightly built, frilly. Subsutural band narrow, weakly or strongly sloping, weakly convex. Entirely white or light tan, occasionally with few brown blotches or narrow to broad brownish-orange band near suture and on siphonal canal. Aperture white or light tan within.

Spire very high, acute, with 1.5–1.75 protoconch whorls. Teleoconch up to 6 weakly convex, narrow whorls. Suture impressed, obscured

by small axial lamellae of following whorl. Protoconch small, whorls rounded, smooth, glossy. Maximum width 600–650 µm, height 600–700 µm. Diameter of first whorl 500–550 µm. Terminal lip delicate, thin, weakly erect, opisthocyrt (boomerang-shaped with the convexity to the right).

Axial sculpture of teleoconch whorls consisting of numerous, low or moderately high, narrow, frilly, orthocline or weakly prosocline lamellae. First whorl with 10–12 lamellae, second with 12–17, third with 16–19, fourth with 18–22, penultimate and last whorls with 19–24 lamellae. Spiral sculpture of low or moderately high, weak or strong, rounded, narrow, squamous, primary, secondary and tertiary cords. First teleoconch whorl of a juvenile with 6 primary cords (P1–P6) (Fig. 1A), quickly separated by secondary and tertiary cords between each pair of primary cords, from second to last whorl. All cords of approximately same size, but occasionally dissimilar, crossed by very narrow, close-set, fringed axial lamellae, occasionally giving a very frilly appearance to the shell. Last whorl with 20–25 cords.

Aperture small or moderately large, narrow. Columellar lip narrow, smooth, with very low parietal tooth adapically. Anal notch shallow, moderately broad. Outer lip weakly erect, very weakly crenulated, strongly flaring adapically, occasionally weakly flaring abapically. Primary and secondary cords ending as very low, smooth crenulations on outer lip, extending as narrow ridges on edge of aperture and very short, narrow denticles inside of edge. Aperture otherwise smooth within. Siphonal canal short, 15–18% of shell length, broad, straight or very weakly dorsally recurved, open.

Radula rachiglossate with a tricuspid rachidian tooth bearing a long, broad, central cusp, 2 or 3 narrow, irregular lateral denticles and a long, broad, lateral cusp, approximately twice less big than central cusp, occasionally with an additional outer lateral denticle. Marginal area smooth, very broad. lateral teeth sickle-shaped with very broad base and narrow, recurved distal end. Presence of a simple jaw (Fig. 8G–J).

Operculum unknown.

Remarks The studied material of *Daphnellopsis fimbriata* has allowed evaluation of the variability of the shell morphology. The length of an

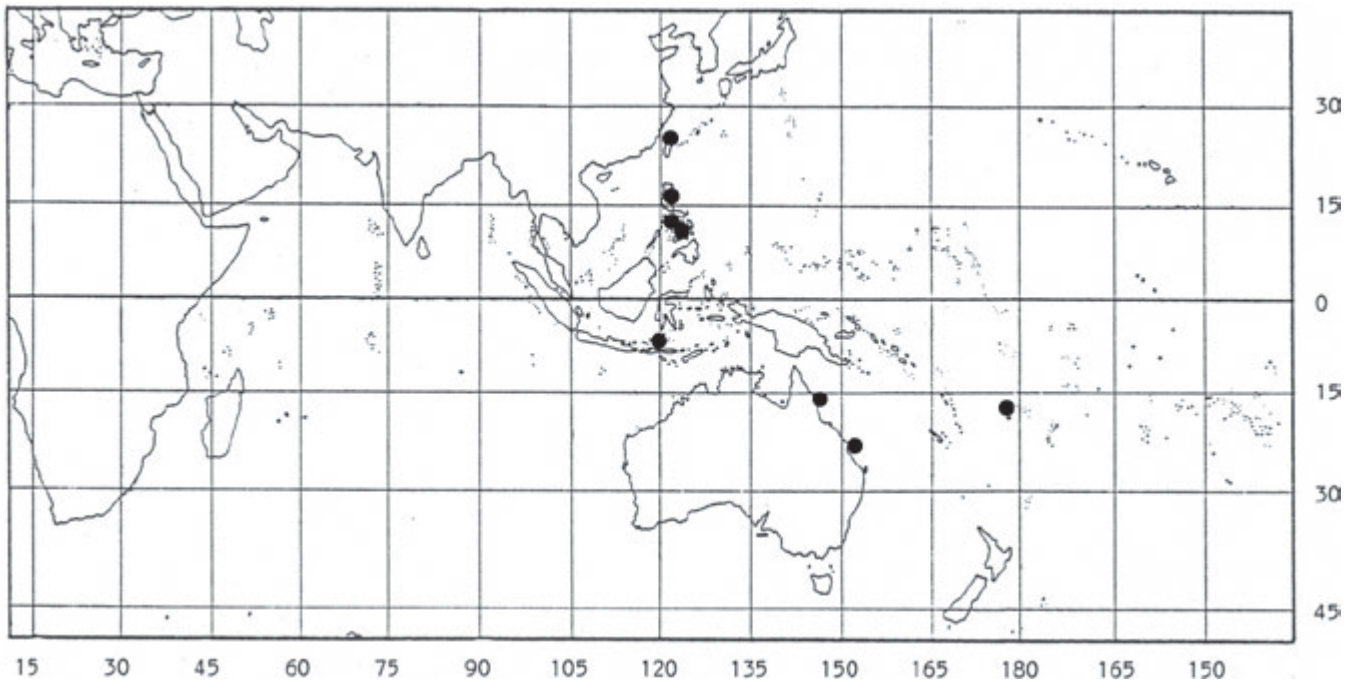


Figure 3 Geographical distribution of *D. lamellosa*.

adult shell varies from 16 to 19 mm for a total of 5.45 to 6.50 teleoconch whorls. The number of axial lamellae is highly variable, from 18 to 24 on the last teleoconch whorl of an adult shell, crossed by 18 to 25 primary, secondary and tertiary spiral cords. The aperture is narrow, small or moderately broad but always strongly ovate with a more or less flaring lip adapically. The protoconch is quite similar in all the examined specimens and the siphonal canal is very short, approximately 15–18% of the total shell length.

Molecular studies would be welcome to confirm the conspecificity of these somewhat disjunct populations, but knowing the variability of shells in the Muricidae I strongly suspect that all these populations belong to a single species.

The presence of a jaw is reported for the first time in a specimen from the Philippines (Figs 8I–J). A similar jaw has also been observed in *Trophon geversianus* (Pallas 1774), *Pagodula aculeata* (Watson 1882) and *Nucella lamellosa* (Gmelin 1791) (Harasewych, 1984) and in *Drupella fragum* (Blainville 1832) and *Phyllocoma convoluta* (Broderip 1833) (pers. obs.). A jaw in the Muricidae is probably more common than actually observed. The jaws in muricids are not as pronounced as in some other groups, so it would not necessarily infer that jaws are absent in taxa just because some authors did not include them in their descriptions (Harasewych, pers. comm.).

The finding of a jaw probably merely reflects a different manner of preparing radulae for SEM.

The function of this jaw is unclear. Harasewych (pers. comm.) suspects that there may be multiple functions. One quite possibly would be to help the radula fold correctly by directing the motion of the lateral teeth. For comparison with other species see below.

Daphnellopsis lamellosa Schepman 1913
(Figs 1B, 3, 10F–Q)

Daphnellopsis lamellosa Schepman, 1913: 449, pl. 30, fig. 10 a-c.

Type material Lectotype ZMA Moll. 3.13.095 (selected by Houart, 1995) and 3 paralectotypes ZMA Moll. 3.13.096; 1 paralectotype RMNH. MOL.309874.

Type locality Savu Sea, Indonesia, 8°27' S, 122°55' E, 247 m (dd).

Other material examined **Philippine Islands:** PANGLAO 2005, stn CP 2408, 9°44' N, 123°47' E, 121–137 m, 1 June 2005, 1 dd, MNHN; MUSORSTOM 3, stn DR 140, 11°43' N, 122°34' E, 93–99 m, 6 June 1985, 2 dd, MNHN, (with *D. hypselos*); AURORA 2007, stn DW 2739, 16°5' N, 121°58' E, 96 m, 1 June 2007, 2 dd, MNHN; AURORA 2007, stn DW 2747, 15°55' N, 121°42'

E, 120–124 m, 2 June 2007, 1 dd, MNHN. **Taiwan:** North East coast, off Tashi, TAIWAN 2001, stn CP 116, 24°55' N, 122°00' E, 100 m, 21 May 2001, 1 dd, MNHN. **Australia:** Queensland, GBR, off Cairns, HMAS Kimbla, stn C16, 17°11' S, 146°38' E – 17°13' S, 146°37' E, 143–150 m, 12 October 1981, 1 dd, AMS C.237591; Queensland, E of North West Id, HMAS Kimbla, stn 23, 23°20' S, 152°35' E, 320 m, 14 December 1977, 3 dd, AMS C.321969; Queensland, E of Lady Musgrave Id, HMAS Kimbla, stn 15, 23°52' S, 152°42' E – 23°52' S, 152°41' E, 296 m, 7 July 1984, 4 dd, AMS C.238192. **Fiji:** Bligh Water, MUSORSTOM 10, stn DW 1314, 17°61' S, 178°15' E, 656–660 m, 05 August 1998, 1 dd, MNHN; south of Viti Levu, MUSORSTOM 10, stn CP 1365, 18°13' S, 178°32' E, 295–302 m, 15 August 1998, 2 dd, MNHN; south of Viti Levu, MUSORSTOM 10, stn CP 1366, 18°12' S, 178°33' E, 149–168 m, 15 August 1998, 2 dd, MNHN.

Distribution Savu sea, Indonesia (type locality), Philippines, northeast coast of Taiwan, Queensland, Australia, and Fiji Islands, dead in 93–660 m. Not collected alive.

Description Shell small for the genus, up to 8.9 mm in length (lectotype). Length/width ratio 2.4–2.9, slender, lanceolate, very narrow, weakly nodose. Subsutural ramp narrow, strongly sloping, weakly convex. White or creamy white (empty shells only).

Spire very high, acute with 1.5 protoconch whorls and teleoconch of 5 narrow, weakly convex, lightly nodose whorls. Suture impressed, obscured by small axial lamellae of following whorl. Protoconch small, whorls rounded, smooth, glossy. Maximum width 500–600 µm, height 400–600 µm. Diameter of first whorl 350–400 µm. Terminal lip delicate, thin, erect, opisthocyrt.

Axial sculpture of teleoconch whorls consisting of numerous low, narrow, weakly prosocline lamellae. First whorl with 10 or 11 lamellae, second with 15–18, third, fourth and last whorls with 20–25 lamellae. Spiral sculpture of low, rounded, narrow primary, secondary and tertiary cords. First teleoconch whorl of a juvenile specimen with P1–P6, second with P1–P6, ADP, MP (Fig. 1B). Fourth and last whorls with 15 to 21 cords, probably IP, P1, s1, P2, s2, P3, s3, P4, s4, P5, s5, P6, s6, ADP, MP, (ABP) and some additional tertiary cords. Spiral cords broader at

intersection with axial lamellae, forming small, rounded scales or nodes.

Aperture small, very narrow, ovate. Columellar lip narrow, smooth with very low parietal tooth apically, rim adherent. Anal notch moderately deep, narrow. Outer lip weakly or strongly erect, strongly flaring apically, occasionally weakly flaring abapically. Primary and secondary spiral cords ending as short, weak or strong crenulations extending on outer apertural lip, forming narrow ridges and short narrow denticles on edge (Fig. 8F). Aperture otherwise smooth within. Siphonal canal very short, 11–14% of total shell length, broad, straight, open.

Radula and operculum unknown.

Remarks *Daphnellopsis lamellosa* differs from *D. fimbriata* in being comparatively narrower with a length/width ratio of 2.4–2.9 compared to 2.0–2.6 in *D. fimbriata*. The shell is smaller for a same number of teleoconch whorls, the aperture is comparatively higher and narrower, the siphonal canal is shorter, the axial lamellae are more numerous and lower, crossing narrower and lower spiral cords, forming a small knob at their intersection.

Daphnellopsis hypselos Houart 1995
(Figs 4, 8C, 11A–D)

Daphnellopsis hypselos Houart, 1995: 258, figs 29, 52, 79–80.

Type material Holotype MNHN 1000.

Type locality Tarempa, Tanjung Pinang, 03°12' N, 106°19' E, 37 m.

Other material examined **Philippine Islands:** MUSORSTOM 3, stn DR 140, 11°43' N, 122°34' E, 93–99 m, 6 June 1985, 1 dd, MNHN (with *D. lamellosa*); AURORA 2007, stn CP2653, 16°6' N, 121°59' E, 83 m, 20 May 2007, 1 dd, MNHN.

Distribution Tarempa, Indonesia (type locality), central and northern Philippines.

Description Shell large for the genus, up to 10.5 mm in length (holotype). Length/width ratio 2.2–2.3, slender, lanceolate, weakly nodose, lightly built. Subsutural band narrow, strongly sloping, weakly concave. Milky white or light tan. Spire high with 1.75 protoconch whorls and up to 5 weakly convex, elongate, very weakly

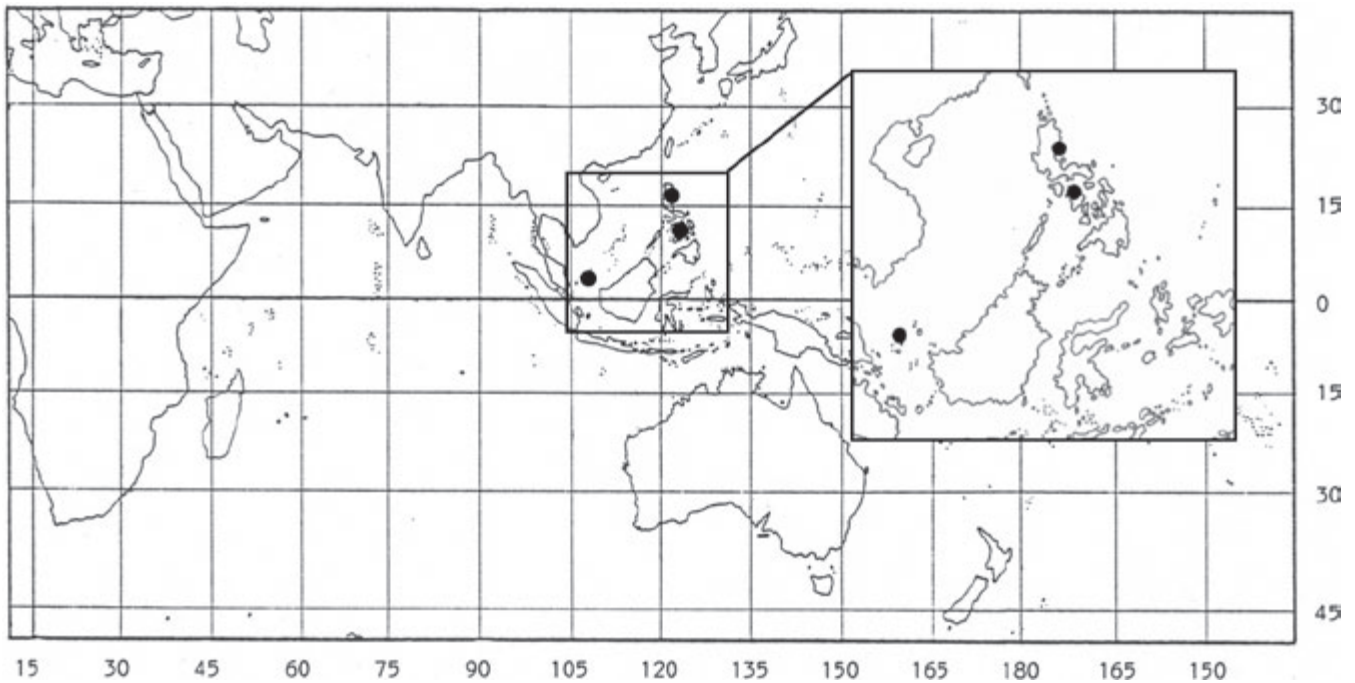


Figure 4 Geographical distribution of *D. hypselos*.

shouldered, nodose teleoconch whorls. Suture impressed. Protoconch small, whorls rounded, smooth. Maximum width 600 μm , height 500 μm . Diameter of first whorl 300 μm . Terminal lip delicate, thin, opisthocyrt.

Axial sculpture of teleoconch whorls consisting of narrow ribs, lamellae, and erratically placed varices. First whorl with 12 broad lamellae, second with 14 broad lamellae and ribs, third with 17 or 18 lamellae and ribs, fourth with 20 or 21 ribs, varices and narrow, thin lamellae. Last whorl of holotype starting with 2 broad varices, followed by 12–14 ribs, decreasing in strength abaperturally and ending with numerous, very low, thin lamellae and a broad, strongly erect apertural (last) varix. Spiral sculpture of low, narrow, weakly rounded, primary and secondary cords. First to third whorls with very low, quite indistinguishable P1–P4, fourth with low P1–P4, s4, followed by a series of cords of same strength and height. Spiral cords more obvious on axial sculpture, almost indistinct between, distinct on abapertural side of apertural varix and on siphonal canal. P1 ending as strong, sharp, broad, adapically bent, short, spine-like projection on apertural varix.

Aperture moderately large, ovate. Columellar lip moderately broad, smooth, with weak, broad, low parietal tooth at adapical extremity, rim adherent. Anal notch narrow, moderately

deep. Outer lip weakly erect, slightly crenulated, weakly flaring adapically. Apertural denticles very low, corresponding to spiral cords. Siphonal canal short, 18–20% of total shell length, broad, straight, weakly dorsally recurved at tip, broadly open.

Operculum and radula unknown.

Remarks *Daphnellopsis hypselos* differs from *D. fimbriata* and *D. lamellosa* in having early teleoconch whorls with broader lamellae, ribs and erratically placed varices *vs* thin lamellae in both other species, and in having a last whorl with very thin, low, almost indistinct axial lamellae. It also differs in having a P1 spiral cord ending as a short, adapically bent broad, spine-like projection, in having very weak spiral cords on the last teleoconch whorl and a comparatively slightly longer siphonal canal. The species seems also to be much rarer.

***Daphnellopsis lozoueti* n. sp.**
(Figs 5, 8D, 11E–H)

Type material Holotype MNHN 25739; 1 paratype MNHN 25740.

Type locality Vanuatu, Pleistocene of Santo, Kere River, near Finmele (site 1), 15°33' S, 166°57' E, coarse detrital level, 20–25 Februari 2006.

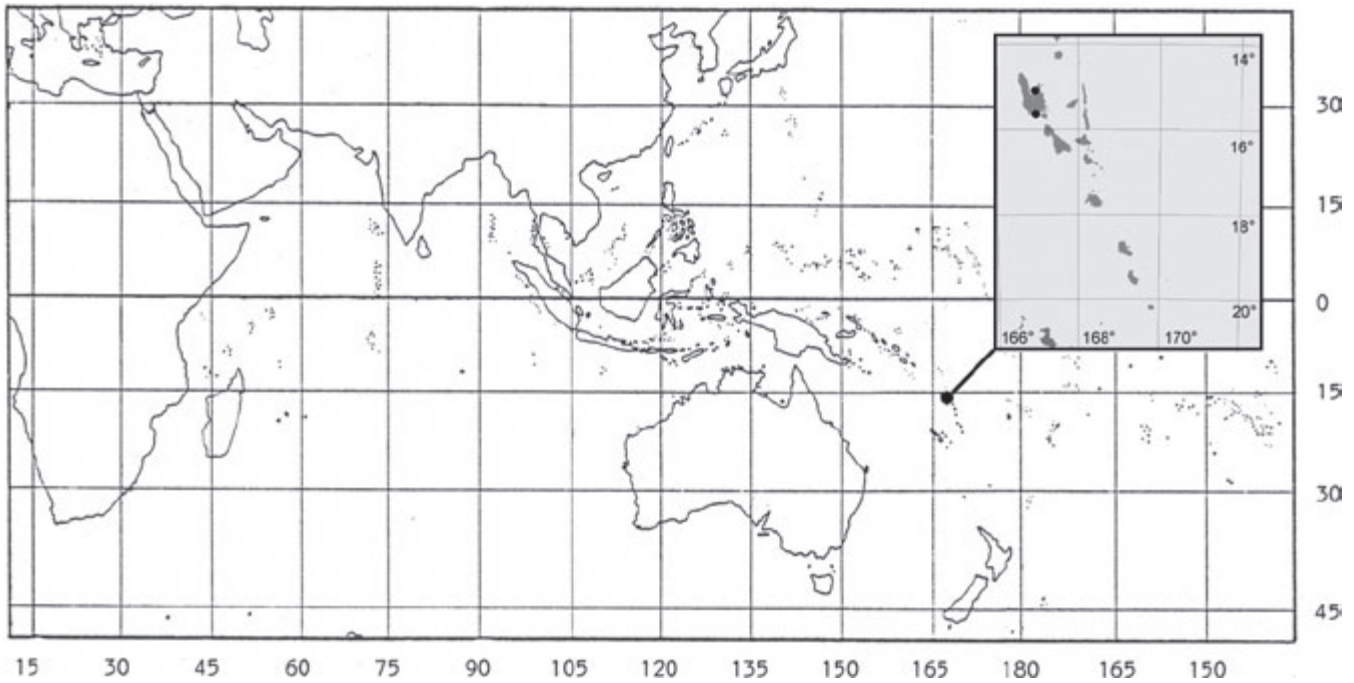


Figure 5 Geographical distribution of *D. lozoueti* n. sp.

Material examined **Vanuatu:** SANTO, Pleistocene of Santo, Kere River, near Finmele (site 1), 15°33' S, 166°57' E, coarse detrital level, 20–25 February 2006, holotype MNHN 25739; BOA 1, Santo, Big Bay, stn DW 2439, 15°07' S, 166°58' E, 98–150 m, 09 September 2005, 1 dd (subfossil), (paratype MNHN 25740).

Distribution One specimen (holotype) was collected in the Pleistocene of Santo, Vanuatu and the paratype was collected dead, probably subfossil, in 98–150 m, also off Santo, Vanuatu. No live, or empty and Recent specimen has been collected so far.

Description Shell large and comparatively broad for the genus, up to 13.9 mm in length. Length/width ratio 2.2, biconical, broadly ovate, nodose, lightly built. Subsutural ramp narrow, strongly sloping, weakly concave. Creamy white.

Spire very high with 2 protoconch whorls and 5 broad, convex, very weakly shouldered, nodose whorls. Suture impressed. Protoconch small, whorls rounded, smooth.

Axial sculpture of teleoconch whorls consisting of very low, occasionally almost indistinguishable, low, broad ribs or broad lamellae, crossed by numerous, high, rounded primary, secondary and tertiary spiral cords, more conspicuous on axial ribs. First teleoconch whorl with 10–14

ribs and 3 spiral cords P1–P3, second whorl with 10–16 ribs crossed by P1–P3, third whorl with 16–21 ribs and P1, s1, P2, P3, fourth whorl with 22–24 ribs and P1, s1, t, P2, P3, s3, starting IP, last teleoconch whorl with 22+ ribs crossed by IP, P1, s1, t, P2, followed by 14–17 cords of unknown ontogeny, weakly decreasing in width and height abapically. P2 broadest cord. Small, spirally elongate nodes at intersection of axial ribs with spiral cords. Spiral cords more conspicuous on apertural (last) varix.

Aperture moderately large, ovate. Columellar lip broad, smooth, with low, broad, parietal tooth at adapical extremity, rim adherent, very weakly erect abapically. Anal notch deep, narrow. Outer lip weakly erect, very weakly flaring adapically and abapically. Apertural denticles low, narrow, corresponding to spiral cords. Siphonal canal short, 20–22% of total shell length, broad, straight, broadly open.

Remarks *Daphnellopsis lozoueti* n. sp. differs markedly from *D. fimbriata* and *D. lamellosa* and does not need to be compared with those. It differs from *D. hypselos* by having a comparatively larger and broader shell with a higher and broader last teleoconch whorl and a relatively shorter spire, broader and higher axial ribs, broader, higher, more numerous and more conspicuous spiral cords and no broad spine-like

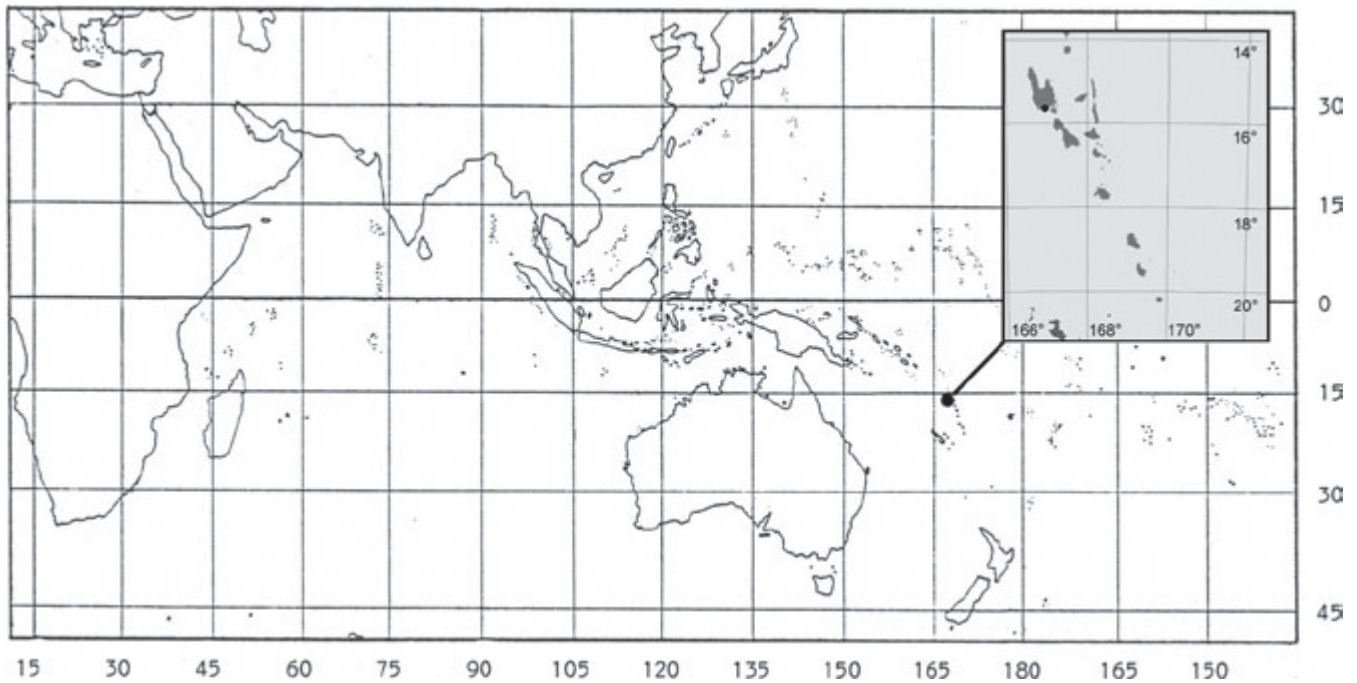


Figure 6 Geographical distribution of *Daphnellopsis pinedai* n. sp.

projection of P1 on the apertural varix as observed in *D. hypselos*.

The illustrated protoconch (Fig. 8D) unfortunately was broken afterwards.

The occurrence of an empty shell of *D. lozoueti* n. sp. dredged in 98–150 m (stn DW2439) could indicate that this species is present in Santo as a fossil and also as a Recent form, like many species of the Quaternary identified by Ladd (1972, 1976, 1977, 1982) also occur in the Recent fauna of the Western Pacific. Nevertheless, this shell collected in 98–150 m depth may have been accidentally driven offshore from a Quaternary deposit, what seems to be the most plausible option given the state of the shell (Fig. 11G–H), almost identical to the holotype (Fig. 11E–F).

Etymology Named for Pierre Lozouet, Muséum national d'Histoire naturelle, who collected the holotype of this new species.

Daphnellopsis pinedai n. sp.
(Figs 1C, 6, 11I–J)

Type material Holotype MNHN 25741.

Type locality Vanuatu, Santo, Pleistocene of Santo, Kere River, near Finmele (site 1), 15°33' S, 166°57' E, coarse detrital level, 20–25 February 2006.

Material examined Known only from the holotype.

Distribution Currently only known from the type locality.

Description Shell large for the genus, 13.5 mm in length (four last teleoconch whorls only, previous whorls broken off), broadly ovate, lightly built, lamellate. Subsutural band very narrow, weakly sloping. Creamy white.

Protoconch and first teleoconch whorls unknown. Four remaining whorls broad, weakly convex, slightly shouldered, lamellose. Suture impressed, obscured by small axial lamellae of following whorl.

Axial sculpture consisting of low, narrow, fringed lamellae and numerous, weak, growth striae. Four remaining whorls probably consisting of third to sixth. Third whorl incomplete, fourth whorl with 11 lamellae, fifth and last whorls with 13 lamellae. Lamellae fringed at intersection of spiral cords. Lamellae of spire whorls of same height, increasing in height adapically on last whorl. Apertural (last) lamellae strongly erect. Spiral cords very narrow and low between axial lamellae, increasing in strength and breadth on lamellae, forming narrow, moderately high, scale-like expansions at intersection with these spiral cords, almost twice as

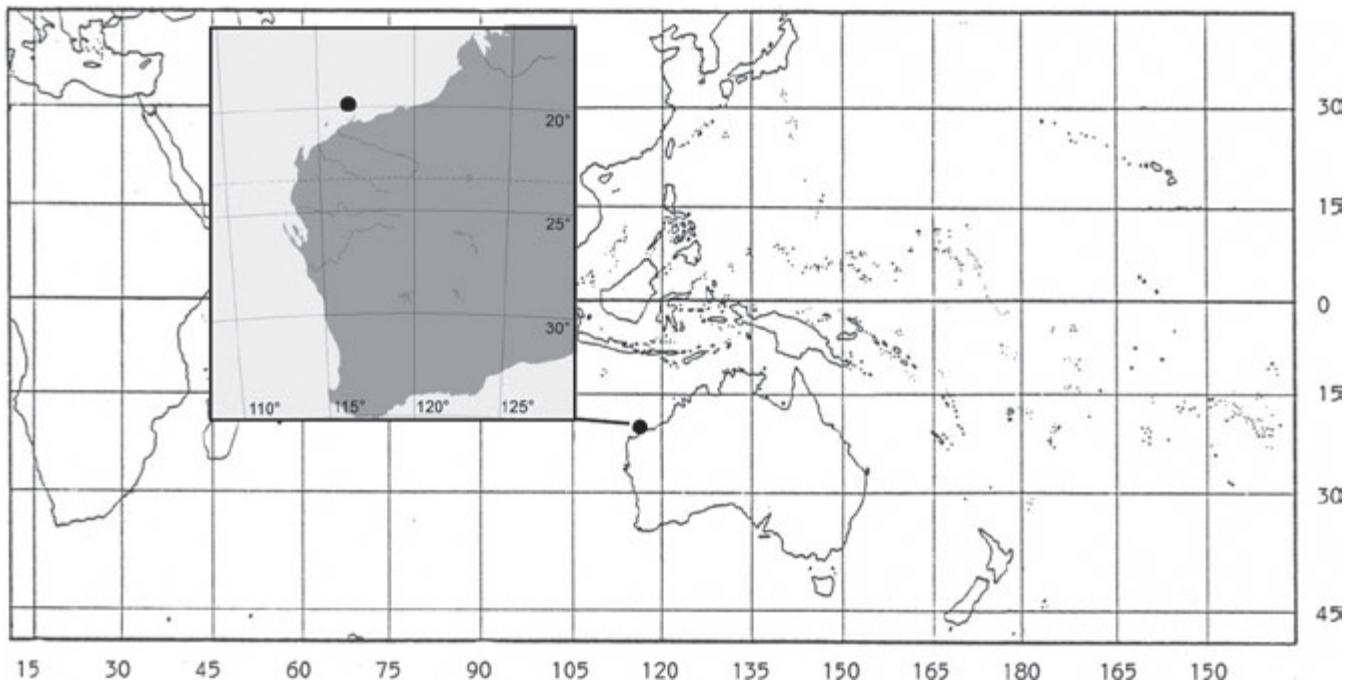


Figure 7 Geographical distribution of *Daphnellopsis lochi* n. sp.

broad and high on abapertural side of apertural varix. Fifteen spiral cords of various strengths on last whorl, probably P1, t, s1, t, P2, s2, P3, s3, P4, P5, P6, s6, ADP, MP, ABP (Fig. 1C). P1 ending as strongly adapically bent, short, broad open spine on few lamellae and on apertural varix.

Aperture moderately small, broadly ovate. Columellar lip narrow, smooth, with weak, low parietal tooth at adapical extremity. Rim partially erect, adherent at adapical extremity. Anal notch moderately deep, broad. Outer lip strongly erect, slightly crenulated, strongly flaring adapically. Nine narrow, moderately high apertural denticles corresponding to primary and secondary cords; aperture otherwise smooth within. Siphonal canal short, broad, strongly dorsally bent at tip, broadly open.

Remarks *Daphnellopsis pinedai* n. sp. differs from the other species by its particular axial and spiral sculpture and in having a broader, less elongate and less ovate aperture with partially erect rim.

The approximate number of teleoconch whorls is an estimate by comparison with young and adult specimens of *D. fimbriata*.

Daphnellopsis pinedai n. sp. was collected together with *D. lozoueti* n. sp. and with *D. fimbriata*.

Etymology Named for Rufino Pineda, who permitted the new exploration of the Kere river outcrops.

Daphnellopsis lochi n.sp.
(Figs 7, 8E, 11K–L)

Type material Holotype AMS C.238316.

Type locality Western Australia, North West Shelf, FRV Soela, beam trawl, stn 26–18, 71 n. m NNW off Dampier, 19°53' S, 116°33' E, 110 m, 26 October 1983.

Material examined Known only from the holotype.

Distribution Currently only known from the type locality.

Description Shell large for the genus, holotype 11.4 mm in length. Length/width ratio 2.4, slender, lanceolate, broadly ovate, lightly built, lamellate. Subsutural ramp narrow, weakly sloping, convex. White.

Spire very high, acute, with 1.75 protoconch whorls and 4 broadly convex, strongly shouldered whorls. Suture impressed or partially obscured by small axial lamellae of following whorl. Protoconch small, whorls rounded, weakly elongate, smooth. Maximum width

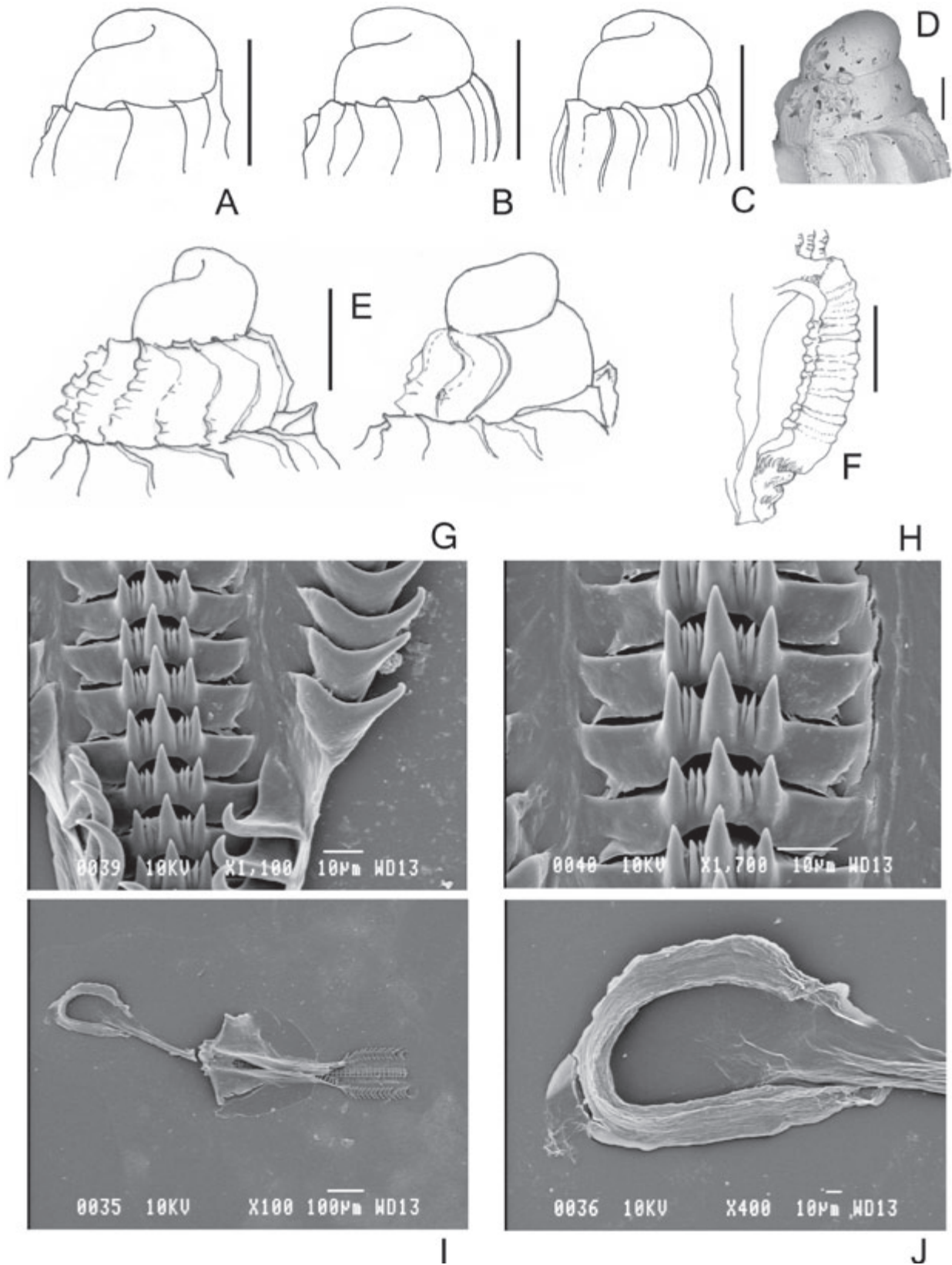


Figure 8 A–D, Protoconchs: **A** *Daphnellopsis fimbriata* (Hinds 1843). New Caledonia, BIOGEOCAL, stn DW253, 21°32' S, 166°29' E, 310–315 m, MNHN; **B** *Daphnellopsis lamellosus* Schepman 1913, lectotype ZMA Moll. 3.13.095; **C** *Daphnellopsis hypselos* Houart 1995, holotype MNHN 1000; **D** *Daphnellopsis lozoueti* n. sp., holotype MNHN 25739; **E** *Daphnellopsis lochi* n. sp., holotype AMS C.238316; **F** Detail of the aperture of *Daphnellopsis lamellosus*; **G–J** *Daphnellopsis fimbriata*, Philippines; **I** Radular ribbon and jaw; **J** Jaw.



Figure 9 *Daphnellopsis fimbriata* (Hinds 1843): A–B North coast of New Guinea, 22 fms (40 m), Lectotype NHMUK 1844.6.7.57, 7.4 mm, C–D. paralectotype NHMUK 1879.2.26.76, 6.2 mm (photo NHMUK); E–F North West Madagascar, between Majunga and Cape St. André, MIRIKY, stn DW 3258, 15°34' S, 45°44' E, 200–288 m, MNHN, 19.9 mm; G Loyalty Ridge, SMIB 5, stn DW 89, 22°19' S, 168°41' E, 295 m, MNHN, 10.7 mm; H–I North of New Caledonia, BATHUS 4, stn DW 894, 20°16' S, 163°52' E, 245–268 m, MNHN, 14.3 mm; J–K Solomon Islands, SALOMON 1, stn DW 1767, 8°19' S, 160°40' E, 98–200 m, MNHN, 6.9 mm; L–M Philippine Islands, MUSORSTOM 3, stn CP143, 11°29' N, 124°11' E, 205–214 m, MNHN, 9.1 mm; N–O Philippine Ids, North of Mindanao, Aliguay Id, 8°45' N, 123°13' E, 50–230 m, RH, 17.3 mm, P. Bohol, Balicasag Id, 9°31' N, 123°41' E, 150 m, RH, 14.5 mm; Q–R Philippine Islands, MUSORSTOM 3, stn CP143, 11°29' N, 124°11' E, 205–214 m, MNHN, 13.5 mm.

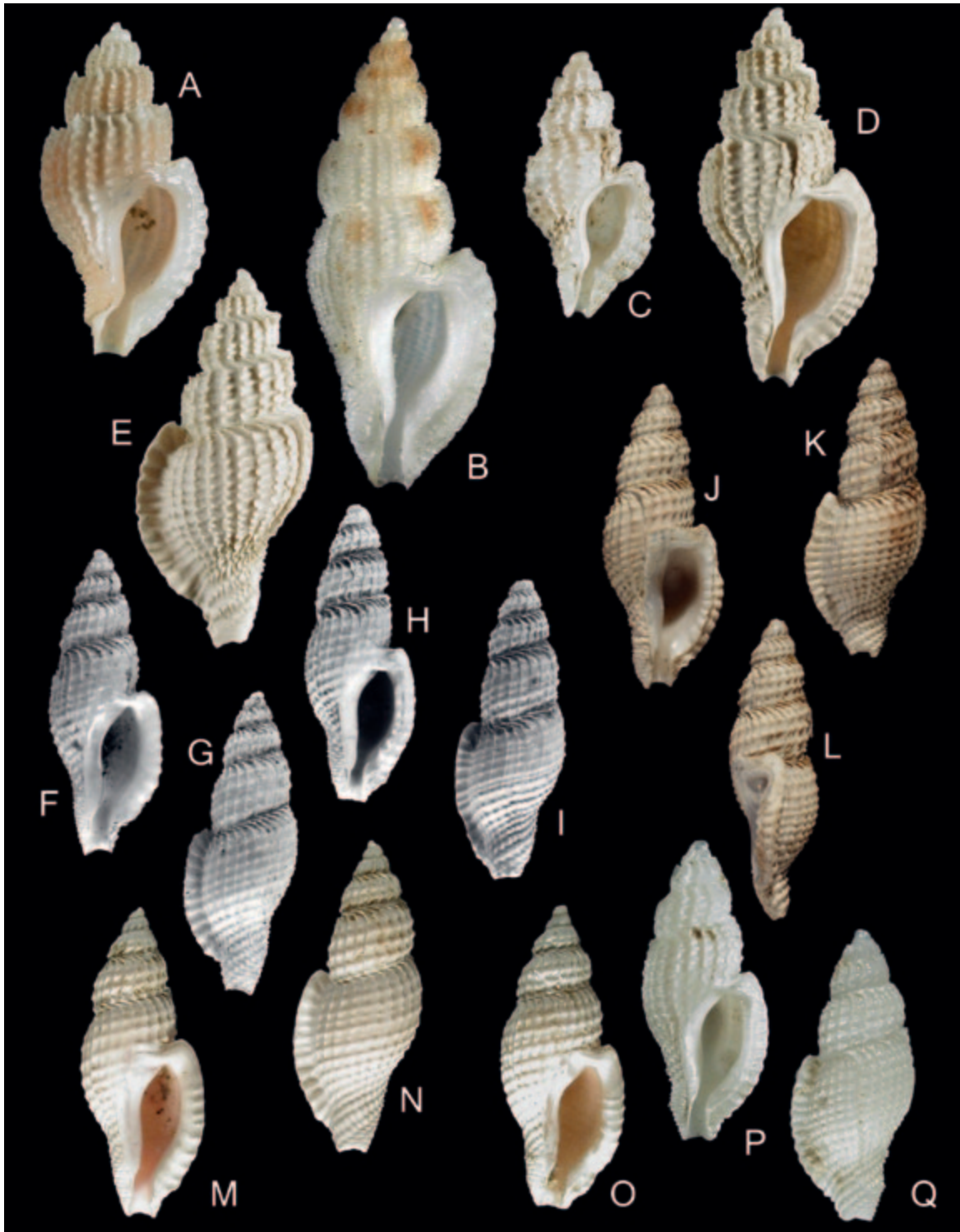


Figure 10 *Daphnellopsis fimbriata* (Hinds 1843): **A** Philippine Ids, Mactan Id, Punta Engaño, 10°19' N, 124°00' E, 180–250 m, RH, 9.5 mm; **B**. Philippine Ids, North of Mindanao, Aliguay Id, 8°45' N, 123°13' E, 50–230 m, RH, 16.5 mm; **C** Vanuatu, Pleistocene of Santo, Kere River, near Finmele (site 1), 15°33' S, 166°57' E, MNHN, 6.6 mm; **D–E** Australia, Northern Territory, Arafura Sea, ca. 100 ml N of Croker Id, MV San Pedro, Box dredge, stn P69–1144, 9°30' S, 132°34' E, 124 m, AMS C.322882, 12.2 mm. *Daphnellopsis lamellosus* Schepman 1913: **F–G** Savu Sea, Indonesia, 8°27' S, 122°55' E, 247 m, lectotype ZMA Moll. 3.13.095, 8.9 mm; **H–I** Paralectotype ZMA Moll. 3.13.096, 8.5 mm; **J–L** Paralectotype RMNH.MOL.309874, 8.1 mm, photo Naturalis Biodiversity Center; **M–N** Philippine Islands, PANGLAO 2005, stn CP 2408, 9°44' N, 123°47' E, 121–137 m, MNHN, 8.3 mm; **O** Philippine Islands, MUSORSTOM 3, stn DR 140, 11°43' N, 122°34' E, 93–99 m, MNHN, 7.7 mm; **P–Q** Fiji, south of Viti Levu, MUSORSTOM 10, stn DW 1381, 18°18' S, 177°54' E, 275–430 m, MNHN, 9.6 mm.

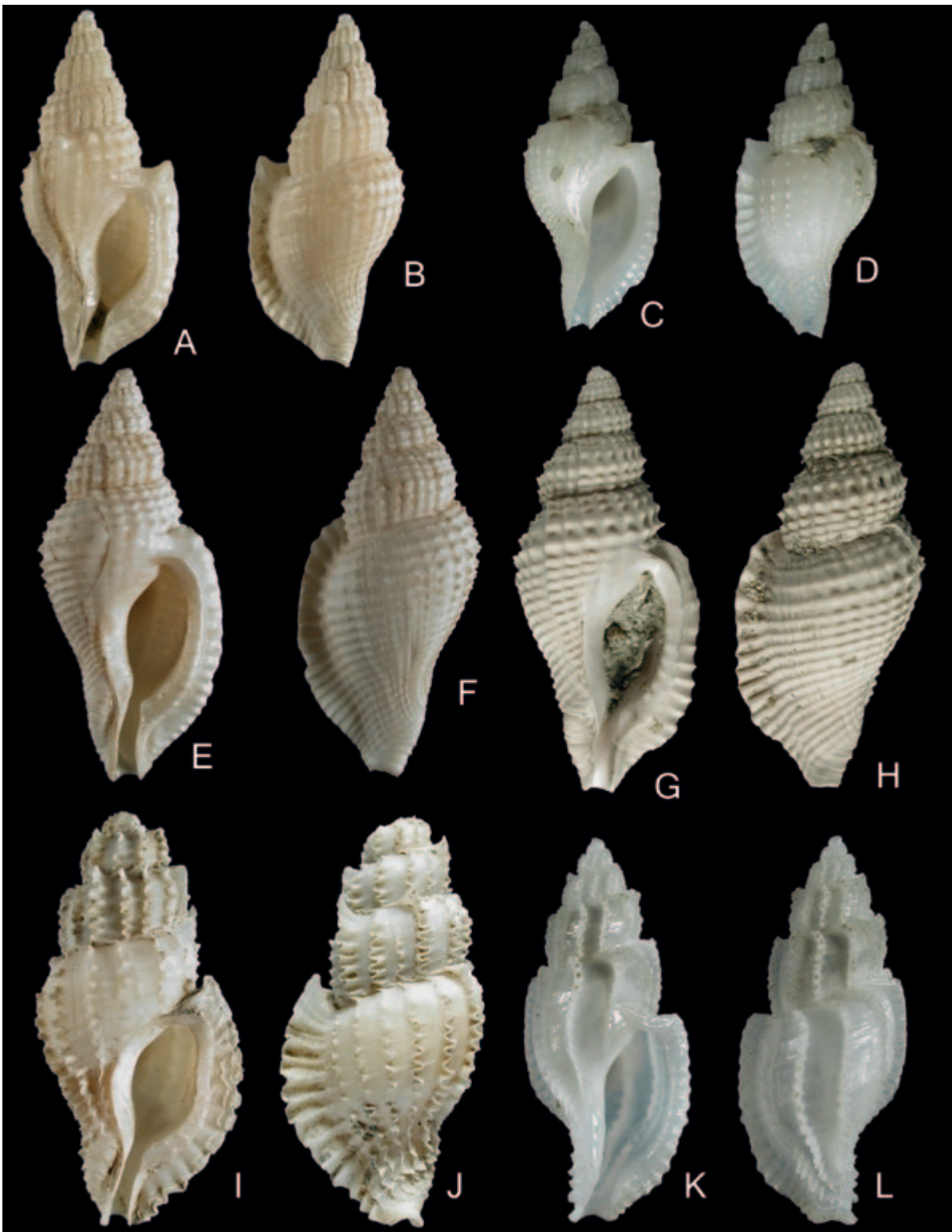


Figure 11 *Daphnellopsis hypselos* Houart 1995: **A–B** Tarempa, Tanjung Pinang, East Sumatra, 03°12' N, 106°19' E, 37 m, holotype MNHN 1000, 10.5 mm; **C–D** Philippine Islands, AURORA 2007, stn CP2653, 16°6' N, 121°59' E, 83 m, MNHN, 8.9 mm; **E–H** *Daphnellopsis lozoueti* n. sp.: **E–F** Vanuatu, Pleistocene of Santo, Kere River, near Finmele (site 1), 15°33' S, 166°57' E, coarse detrital level, holotype MNHN 25739, 13.2 mm; **G–H** Vanuatu, Santo, Big Bay, BOA 1, stn DW 2439, 15°07' S, 166°57' E, 98–150 m, paratype MNHN 25740, 13.9 mm. *Daphnellopsis pinedai* n. sp.: **I–J** Vanuatu, Pleistocene of Santo, Kere River, near Finmele (Kere 1), 15°33' S, 166°57' E, holotype MNHN 25741, 13.1 mm. *Daphnellopsis lochi* n. sp.: **K–L** Western Australia, North West Shelf, FRV Soela, beam trawl, stn 26–18, 71 n. m NNW of Dampier, 19°53' S, 116°33' E, 110 m, holotype AMS C.238316, 11.4 mm.

600 μm , height 700 μm . Diameter of first whorl 400 μm . Terminal lip delicate, thin, weakly erect, weakly opisthocyrt.

Axial sculpture consisting of narrow, high, frilly, narrow, weakly opisthocline lamellae and very low, weak, numerous growth striae. First whorl with 12 lamellae, second and third with 11, last whorl with 8 lamellae, apertural (last) varix weakly higher. Spiral sculpture nearly invisible between lamellae on spire whorls, only distinct on lamellae, forming narrow frills. Last whorl with very low primary and secondary cords, only visible under low-angled light, for a total of 18 cords, ending as narrow frills on lamellae.

Aperture large, broadly ovate. Columellar lip broad, smooth, rim adherent, limit of rim indiscernible. Anal notch shallow, broad. Outer lip flat, with broad, weakly flaring lip apically and abapically, very weakly crenulated with low, narrow denticles, corresponding to spiral cords. Aperture smooth within. Siphonal canal very short, 14% of total shell length, broad, strongly dorsally bent at tip, broadly open.

Operculum and radula unknown.

Remarks *Daphnellopsis lochi* n. sp. differs in many ways from the other species, especially by the small, high, narrow first whorl of the protoconch, by the lack of distinct spiral cords between the axial lamellae, and by its broad aperture.

Daphnellopsis lochi differs from *D. hypselos* in having a lighter, thinner shell with a higher protoconch with a higher first whorl, in having narrower, less numerous and more frilly axial lamellae, obsolete spiral cords between lamellae and a larger, broader aperture with non-erect outer lip.

It also differs from *D. fimbriata* in having a lighter, thinner shell with a higher, smaller protoconch, in having more widely spaced and less numerous axial lamellae, being almost smooth between them *vs* rounded spiral cords in *D. fimbriata*. The aperture is also larger and broader in *D. lochi* n. sp.

Etymology Named for Ian Loch from the Australian Museum, Sydney, who discovered this specimen while sorting turrids in the Australian Museum.

CONCLUSION

There are six species occurring in the Indo-West Pacific, of which three new are described herein.

Four of these species are represented by only a few specimens but the shell morphology definitively separates them from each other and from the other two species.

Four additional fossil species from France are also known. Merle (1989) included *Eupleura ogormani* Cossmann 1923 from the early Eocene in *Daphnellopsis* and in a subsequent study of fossil and Recent species of *Lindapterys*, Lozouet *et al.* (1994) identified two additional species, *D. boutillieri* (Cossmann 1889) from the middle Eocene of the Paris Basin and *D. bipartitum* (Vasseur 1881) from the middle Eocene of Loire-Atlantique, while they also described *D. tournoueri* Lozouet, Ledon & Lesport 1994 from the Middle Miocene of Touraine. Since the Quaternary the genus has been restricted to the Indo-West Pacific.

The placement of *Daphnellopsis* in the Muricidae is confirmed by anatomical study (Y. Kantor pers. comm.).

Daphnellopsis was classified in the Ergalataxinae (Houart, 1995) based on affinities with *Maculotriton* Dall 1904. The genetic study of this peculiar genus has not yet been possible, so, until more information is known about its possible relationship with any of the existing subfamilies, I retain it for the moment in this subfamily, together with its possible sister genus *Lindapterys* as was already done by Houart (1995) and Vokes (1996).

This review is based on specimens from only a few collections and the geographical distribution of some species will certainly be updated when these are correctly identified and placed within the right family. This is also one of the goals of the review.

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